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(54) AN ARTICLE OF FURNITURE

(71) We, GERDI KERSTHOLT AND FRITZ KERSTHOLT, of 11 Am Wackenbach, 6331 Leun, German Federal Republic, both German citizens do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to an article of furniture such as a couch, bed or chair comprising a base frame and a plurality of support members providing a multi-section support surface for a user reclining on the article.

15 In the case of one known couch, to each liftable support member there is attached an articulately disposed shackle, which engages in a catch at the base of the couch.

20 If the end of one such support member is lifted, then the shackle slides over the teeth of the catch, upon ending of the movement at the then attained position to fall into the catch and to support the member in its raised position. If one subsequently wants to set that support member to a flatter angle, then initially one must raise the support member again, so that the shackle comes out of the toothing of the catch. By

30 means of a pulling device secured at the shackle, one can then disengage the shackle from the toothing. This mode of the operation of the couch is very awkward, and may not be carried out by a person situated on the couch. In order to overcome this disadvantage, it has been proposed to provide an electric motor, which is controllable by the user of the couch and which executes the desired displacement of the respectively

40 associated support member by means of spindle or rack drive. However, this solution is very expensive.

According to the present invention, there is provided an article of furniture comprising a frame, axle means provided

on the frame, an inner support member pivotably supported on the axle means to be pivotably displaceable about a substantially horizontal axis of pivotation defined by the axle means, two outer support members each pivotably connected by respective hinge means to a respective one of two mutually opposite edge portions of the inner support member, the support members constituting parts of a multi-part structure for supporting a user resting on the article, at least one of the support members being connected by at least one spring support system to the frame, the outer support members each being individually pivotable about an axis of pivotation defined by the respective hinge means within predetermined limits independently of each other and of the inner support member, the axes of pivotation of the respective hinge means each extending substantially parallel to the horizontal axis of pivotation of the inner support member, and each outer support member being individually connected to means selectably operable to lock the respective outer support member relative to the frame.

At least one of the outer support members may be provided with at least one arm member projecting therefrom to be displaceable therewith, and at least one spring support system may be connected to the respectively associated outer support member via the respective arm member projecting therefrom.

At least one of the outer support members may be provided with at least one arm member which projects therefrom and which is rigidly connected therewith, and at least one spring support system may be connected to the respectively associated outer support member via the respective arm member projecting therefrom.

At least one of the outer support members may be mounted on a horizontal axle

to be pivotably displaceable either anti-clockwise or clockwise within predetermined limits.

A central portion of the inner support member may be connected to the axle means.

Bearing means of the axle means may be so mounted on the inner support member as to be disposed in the central two quarters of a dimension of the inner support member extending substantially perpendicularly of the axis of pivotation thereof. The article may be provided with an inner support member which is lockable relative to the frame.

The advantage of a couch embodying the invention is that the outer support members can be set steplessly without employing a motor and without manually lifting an outer support member in order to free it from a ratchet. The support members can be brought into a desired relative position by a user shifting his posture so as to redistribute the weight of his body between the variout support members.

Embodiments of the invention will now be more particularly described with reference to the accompanying drawings, in which:—

Fig. 1 shows an article of furniture in the form of a couch with three movable outer support members;

Fig. 1a shows an alternative form of the couch shown in Fig. 1;

Fig. 2 shows a clamping device for arrester members of the couch shown in Fig. 1;

Fig. 3 shows a control device for pressure fluid operable springs described in connection with Fig. 1;

Fig. 4 shows a clamping device for clamping the support members;

Fig. 5 shows a couch in accordance with one embodiment of the invention;

Fig. 5a shows part of a couch actuator mechanism in accordance with another embodiment of the invention;

Fig. 5b shows part of a couch actuator mechanism in accordance with a further embodiment of the invention;

Fig. 6 shows a couch with a clamping device connected to an arm projecting from an inner support member of the couch; and

Fig. 7 shows still another embodiment of the couch.

As evident, in several of the drawings the base frame of the couch is cut away in order to allow details of the construction of other parts of the couch to be better recognised.

In Fig. 1, the base frame 10' of the couch is bent from tube and the middle or

inner of three support members 12, 17, 13 is pivotably supported by horizontal axle means 11 provided on an arm 10' of the base frame. Each of the three support members is in the form of a frame. To each end of the inner support member 17 there are pivotably connected respective ones of two outer support members 12 and 13 by means of pivot joints 14'. The support member 12 is intended to support the head of a person reclining on the couch and the support member 13 is intended to support the lower legs and feet of a user. The inner support member 17 is provided with a downwardly pointing arm 17' and the two outer support members 12 and 13 are also each provided with a respective arm 15. The arms 15 are each U-shaped. The arm 17' is connected with the arm of the foot support member 13 by spring support system 16', comprising a normal thrust spring. This arrangement has the advantage, that the foot support member 13 is subjected to a spring force which remains substantially constant during the swinging of the middle support member 17. With the arm 15 of the head support member 12 there is associated a spring support system 16', comprising telescopic elements which operate progressively, which engage at such a point of the base frame 10' and which is so arranged that, after its components have been telescoped to a certain extent, the spring support system 16' then acts as an uncompressable link which connects the outer support member 12 to the base frame 10'.

Advantageously, the engagement point of the spring support system 16' on the base frame 10' is so chosen, that during the downward inclination of the head support member 12 in relation to the line of action of the spring support system 16, a progressively increasing leverage is obtained, which attains its maximum value when a defined angular position of the head support member 12 is reached, preferably when the head support member 12 is situated in its horizontal position. This applies in respect of the couch provided with three movable support members, so that for the spring support system 16' a progressive increase in the effective length of the lever arm is obtained for example both during the inclination of the head support member 12, and also during the inclination of the inner support member 17 whilst the angle between the two support member 12 and 17 is maintained constant. The effective length of the lever arm also progressively increases during the simultaneous inclination of the support members relative to the base frame 10' and relative to one another. In particular, in the last named case, this is particularly large, and thus par-

particularly effective. At the arms 15 there are articulatedly secured link members 20, which by slotted holes 20' surround a pin 19, of a clamping device, which is actuable by a handle 31. The clamping device is common to all the link members 20 and is provided with two elements in the form of cam plates 21. The clamping device will be more fully described with reference to Fig. 2.

With advantage, in the case of this couch and the couches to be described below, the link members 20 can be so formed that for the support members with which they are respectively associated, they act simultaneously as limiters to limit the extent to which such support members can be pivotably displaced relative to the base frame.

Let it be assumed that the support members are situated in the relative position to one another indicated in broken lines in Fig. 1. If now the user of the couch inclines the part 12 or even the parts 12 and 17 simultaneously by leaning back rearwardly, then the telescopic elements of the spring support system 16' are pressed together as far as possible and, thereafter, serve as a limiter device, which provides a rigid supporting bearing for the arm 15 of the part 12, on which the latter supports itself during the further inclination, and by which it is guided round in an arc about the point of connection of the spring support system 16' with the base frame. Thus, on the part 12 being pivotably displaced further in the clockwise sense relative to the horizontal, these movements continue until the part 12 rests by its free end on the rear end of the base frame member 10', which is curved upwardly and which behaves as a limiter element. As shown in Fig. 1, when the outer support member 12 is horizontal and in contact with the vertically extending end portion of the base frame 10', then the inner support member 17 and the outer support member 13 are also in their horizontal positions.

The inclination of the foot part 13 is adjustable relative to the horizontal by corresponding pressure of the legs of the user against the force of the resilient means in the form of the spring support system 16'.

As indicated in Fig. 1, a respective link member 20 is associated with each movable part 12, 13 and 17, which by means of the common clamping device, mounted on the arm 10'' of the base frame member 10', can be fixed in their respective relative position. The clamping device is actuable by means of the handle 31.

The spring support system 16'' associated with the foot part 13 may be connected directly to the foot support member 13 as shown in Fig. 1a.

The operation of the described couch is

particularly favourable when spring support systems with non-linear, for example steplike, spring characteristics are employed. The spring support system associated with the head part 12 may include telescopic elements coming into action in a stepwise manner.

Is it a particular feature of a couch embodying the invention that the outer support members are each capable of being individually pivoted about an axis of pivotation defined by the respective hinge means within predetermined limits independently of each other end of the inner support member. It is therefore possible to alter the relative angular position of one support member selectably at will, but simultaneously to maintain the inclination of the other support members unchanged, or conversely to maintain the angular position of the one support member and to alter the angular position of the other support members or to move both outer support members simultaneously in or counter to the clockwise sense. By the balanced nature of the system, each adopted position of the support members can be maintained. With a couch embodying the invention there may be achieved a wide variation of lying and seating possibilities.

One embodiment of the clamping device which is associated with the pin 19 is shown in Fig. 2. On the arm 10'' there is borne the pin 19, which carries at its one end fixedly mounted pressure plates 19', at its other end two cam plates 21, which act in the direction of its longitudinal axis and of which one is held in its angular position on the base frame, while the other is rotatably displaceable by means of the handle 31 about the pin 19 and stresses the latter more or less in tension, in accordance with the relative position of the cam plates relative to one another. The link members 20 embrace the pin 19 by their slotted holes. They are separated from one another by pressure plates 19'. It is easily to be seen, that with changing longitudinal stress of the pin 19, the strip members 20 are pressed against one another with different pressure, and thereby fixed relative to the pin 19.

In place of the shown embodiment for the clamping device, also with advantage such a one is employable, in which in place of the facing cam plates embracing the pin 19, two eccentric cam plates each disposed parallel to the longitudinal axis of the pin are borne on both sides by means of an axle guided transversely through the pin, and are settable in common by means of a handle. This clamping device and the above described one represent quick-action clamping devices, because by them the desired fixing or freeing of the link members can be effected quickly by only a simple lever

movement.

For certain applications, it can be desired, that one or more link members yield during the exceeding of a predetermined loading of part of the couch, until the part has adopted its horizontal position. For this purpose one associates with the corresponding link member its own clamping device, in which a helical spring of corresponding dimensioning is situated between the rear cam plate and the last pressure plate. During the tightening by means of the cam plate, then the link member is made fast only so strongly, as corresponds to the force of the helical spring. An example of this construction is indicated in Fig. 2 in broken lines.

Although the link members are represented and designated as strips, these can also be in the form of loops of rigid material. In the event that a particularly strong pressure stressing is necessary, the link members can also be provided in the region of the clamping device with a roughened or a toothed portion. In the last named case, the pressure plates are provided with a roughened or toothed portion corresponding to the roughened or toothed portion on the link member.

In place of the link members 20 and of the springs 16' and 16", with advantage gas springs can be used. As evident, the arms 15 of the members 12 and 13 may each be connected with the arm 10" of the base structure by means of a respective gas spring. At this arm 10" there is mounted a control device, which permits the two springs to be fixed or freed individually or together. An example of such a control device is shown in Fig. 3 and described hereafter. The gas springs behave here simultaneously as spring support systems and as link members, which is possible because of their particular construction.

A common axle — mounted on the arm 10" of the base for the gas springs is a tube 50, in which bores 51 are provided. Each of gas springs 48 and 49 is screwed by its end into a thread 52, which is mounted at right angles at bearing bushes 53, which by their internal diameter are co-ordinated with the outer diameter of the tube 50. In the tube 50 there is displaceably borne a control piston 54, which is chamfered at its two ends. Its length is so dimensioned, that the control pins 48' and 49' respectively of the gas springs 48 and 49 can simultaneously rest on the untapered part of the surface of the piston 54. By displacement of the control piston 54 in the one or the other direction (indicated by double arrow) by means of a handle 31, it is possible to lock the two gas springs 48 and 49 selectively simultaneously or individually, and thus to fix or to free the res-

pectively associated support member or support members.

Now it can be desired that only one of the support members of the lying surface should be altered in its relative position to the base, while the other or the others should maintain their position. In these circumstances, a clamping device which is operable in a stepwise manner — such as that shown in Fig. 4 — may be employed. This device is provided with a member 39, which is rigidly connected with the base frame (not shown in Fig. 4) of the couch. The member 39 is provided at each of its two ends with a respective transverse bore, through which clamping bolts 27' and 27" pass. The clamping bolt 27' carries at its one end an inwardly rounded-off head and, at its other end, a thread on which an inwardly rounded-off nut is put. The other clamping bolt 27", which at one end is provided with a head and at the other end carries a pair of plates 30 each eccentrically mounted on a pin 29. The plates 30 are rotatable together about the pin 29 by means of a handle 31. The two clamping bolts 27' and 27" are loosely connected at each side of the member 39 by strips 37 of spring steel. Between the member 39 and the strips 37 there extend link members 34 and 36 which as shown in Fig. (4) are constructed as rods and which are shown in cross-section and at any time two of which, disposed opposite to one another, are associated with one support member of the multi-section lying surface, the two others with another part of the lying surface. Securing pins 39' ensure that the link members 34 are held to be disposed opposite the upper part of the member 39. The maximum spacing of the strips 37 in the region of the clamping bolt 27' is so set, that it is a little smaller than the width of the member 39 plus the diameter of the two link members 34. If the eccentric plates 30 are rotated by actuation of the handle 31, then by means of the strips 37, on which the eccentric plates exert a pressure, initially the link members 34 are clamped fast, while the members 36 are still freely movable. During further rotation of the eccentric plates 30, the strips then bend and clamp fast also the link members 36. One therefore has it in the hand, by means of this quick-acting clamping device, to hold fast only one of the support members, but to leave the other movable, or however to clamp both support members.

Fig. 5 shows another embodiment in which the middle or inner support member 17 is pivotably supported by a horizontal axle 11 on the base 10. As shown in Fig. 5, the support member 17 is provided with a downwardly pointing arm 17'. Foot part 130

13 and head part 12 are connected by means of hinge joints 14' to the middle support member 17. A simple telescopic spring 16" form one spring support system 5 a step-wise operable telescopic spring 16' forms another spring support system. The clamping device for the link members is mounted on an arm 18 of the frame 10. Here also, as in the case of that shown in 10 Fig. 2, the spring 16' can be so associated that it serves as supporting bearing for the rearwardly inclinable support member 12, from a determined relative position of the support members 12, 17 and 10. It is 15 however also possible so to arrange the link member 20 associated with the part 12, that it acts as a supporting bearing in the fully lowered position. As shown in Fig. 5a, the arm 15 of the part 12 carries at its free end a roller 33, which can co-operate with a 20 ramp 35 supported on the base frame 10. The inverse of this arrangement is indicated in Fig. 5 in broken lines where at the frame 10 on both sides rollers 32 are rotatably 25 supported, which can co-operate with the rear side of the part 12.

In some applications, in particular in the case of couches used by ill or disabled persons, it is desirable to be able to present 30 the inclination of the head support member 12 at which the spring support system begins to act as a bearing. An example of this is shown in Fig. 5b in front aspect. A spring support system comprising a telescopic spring embraces by its upper eye 35 the cross part of the arm 15 of the part 12, while its lower eye is secured by means of an axle 14" at the arm 18 of the base 10. On this axle 14" there are mounted on both 40 sides of the telescopic spring respective strips 37", which are connected with one another by means of a ring 38 embracing the telescopic spring. With each of these strips there is associated a further strip 45 37', which at its upper end displays a V or semi-circular-shaped recess for the reception of the arm 15. The strips 37' have a plurality of apertures 40, to two of which a guide pin 41 mounted in the strip 37" 50 and a wing bolt 42 screwable into the strip 37" correspond. As evident, the strips 37' after releasing of the bolts 42 allow themselves to be associated differently with the strips 37", and so the length of the sup- 55 porting bearing may be varied to adapt the extent of the screwing movement of the part 12 to the needs of a user of the couch.

Fig. 6 shows a couch, in which the clamping device for the link members is 60 mounted at the arm 17' of the middle support member 17. As a spring support system there is here provided a telescopic spring 16', which operates in a stepwise manner and a normal tension spring 16. The tele- 65 scopic spring system engages the arm 15

of the foot support member 13, and the middle support member 17 directly. As indicated in broken lines, the middle support member 17 can be connected, via a spring arrangement 16", with the arm 18 of 70 the base 10.

Fig. 7 shows another article of furniture in the form of a bed or couch embodying the invention and in which the base structure comprises a frame 10 of triangular 75 shape as seen in Fig. 7. As indicated in Fig. 7, the support members 12, 13 and 17 are each provided with a respective squab member which, when the support members are mutually aligned as shown in Fig. 7, forms 80 a flat surface. Thus, the couch may be used as a bed. The support member 13 is pivotably connected via a hinge 14' to the middle support member 17, which is connected to a horizontal axle mounted in the 85 base structure 10. One end portion of the middle support member 17 is cranked and the extremity of the cranked portion is pivotably connected via another hinge 14' to the support member 12. The middle sup- 90 port member 17 is provided with rigid dependent arms 17' and the support members 12 and 13, each provided with respective rigid arms 15, are urged towards respec- 95 tive raised positions by resilient means 16' and 16", which are connected between adjacent ones of the arms 15 and 17'. The lower end of the arm 15 which is rigidly connected to the support member 12 is pro- 100 vided with a roller 33, which engages a ramp 35 supported on the base 10. Respective link members 20 are associated with each of the support members 12, 13 and 17. These link members are lockable by means of a common clamping device, which 105 is provided with an actuator handle 31. The middle support member 17 also is connected to the base frame 10 by resilient means 16'.

It is possible, as shown in Fig. 6 for example, to mount the clamping device on 110 a link member or on a spring support system.

Some aspects of the present invention may be applicable to chairs and seats as well as to couches. Therefore, protection is 115 desired for such applications, the extent of such protection being defined in the following claims.

WHAT WE CLAIM IS:—

1. An article of furniture comprising a 120 frame, axle means provided on the frame, an inner support member pivotably supported on the axle means to be pivotably displaceable about a substantially horizontal axis of pivotation defined by the axle 125 means, two outer support members each pivotably connected by respective hinge means to a respective one of two mutually opposite edge portions of the inner support member, the support members constituting 130

- parts of a multi-part structure for supporting a user resting on the article, at least one of the support members being connected by at least one spring support system to the frame, the outer support members each being individually pivotable about an axis of pivotation defined by the respective hinge means within predetermined limits independently of each other and of the inner support member, the axes of pivotation of the respective hinge means each extending substantially parallel to the horizontal axis of pivotation of the inner support member, and each outer support member being individually connected to means selectably operable to lock the respective outer support member relative to the frame.
2. An article as claimed in claim 1, wherein at least one of the outer support members is provided with at least one arm member projecting therefrom to be displaceable therewith, and at least one spring support system is connected to the respectively associated outer support member via the respective arm member projecting therefrom.
3. An article as claimed in claim 1, wherein at least one of the outer support members is provided with at least one arm member which projects therefrom and which is rigidly connected therewith, and at least one spring support system is connected to the respectively associated outer support member via the respective arm member projecting therefrom.
4. An article as claimed in claim 1, wherein at least one of the outer support members is mounted on a horizontal axle to be pivotably displaceable either anti-clockwise or clockwise within predetermined limits.
5. An article as claimed in any one of the preceding claims, wherein a central portion of the inner support member is connected to the axle means.
6. An article as claimed in claim 5, wherein bearing means of the axle means are so mounted on the inner support member as to be disposed in the central two quarters of a dimension of the inner support member extending substantially perpendicularly of the axis of pivotation thereof.
7. An article as claimed in any one of the preceding claims, wherein the inner support member is lockable relative to the frame.
8. An article as claimed in any one of the preceding claims, wherein at least one spring support system has a non-linear characteristic.
9. An article as claimed in any one of the preceding claims, wherein at least one spring support system comprises a gas spring.
10. An article as claimed in claim 9, wherein the gas spring is lockable to fix the respective outer support member relative to the base frame.
11. An article as claimed in any one of the preceding claims, wherein the locking means comprises a common clamping device which is manually operable to lock at least the two outer support members to the frame.
12. An article as claimed in claim 11, wherein the common clamping device is mounted on the base frame.
13. An article as claimed in claim 11, wherein the common clamping device is mounted on one of the support members.
14. An article as claimed in claim 11, wherein the common clamping device is mounted on an arm, which projects from and is rigidly attached to one of the support members.
15. An article as claimed in claim 11, wherein the common clamping device is so operable that the support members associated therewith are successively locked or freed relative to the frame on respectively corresponding actuation of the common clamping device.
16. An article as claimed in claim 11, wherein at least one of the support members is coupled to the common clamping device via a friction coupling.
17. An article as claimed in any one of the preceding claims, wherein the inner support member and the frame are interconnected by at least one spring support system.
18. An article as claimed in any one of the preceding claims, wherein at least one limiter device is associated with at least one outer support member, the limiter device becoming effective in dependence on the position of the movable inner support member relative to the frame and being constructed as a bearing to support the respective outer support member, which outer support member is pivotably displaceable beyond the position at which the limiter device becomes effective to lift the end portion of the inner support member.
19. An article as claimed in claim 18, wherein the spring support system connected to the outer support member acts as the limiter device.
20. An article as claimed in claim 18, wherein the limiter device is so constructed and arranged as to act simultaneously as the bearing to support the outer support member.
21. An article as claimed in claim 18, wherein the limiter device is settable in more than one position relative to the axle means.
22. An article as claimed in claim 1, wherein at least one outer support member

is provided with an arm so disposed relative to the line of action of a spring support system connected thereto that — on the respective outer support member being
5 pivotably displaced in such a direction as to tend to increase the force exerted thereon by the spring support system — the effective lever arm exerted on that outer support member by the spring support system in-
10 creases for a predetermined range of inclination.

23. An article of furniture provided with a frame and with a multi-part structure for supporting a user resing on the article, substantially as hereinbefore described with 15 reference to the accompanying drawings.

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Agents for the Applicant(s)

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Fig. 2

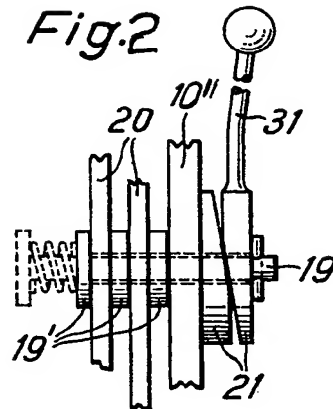


Fig. 4

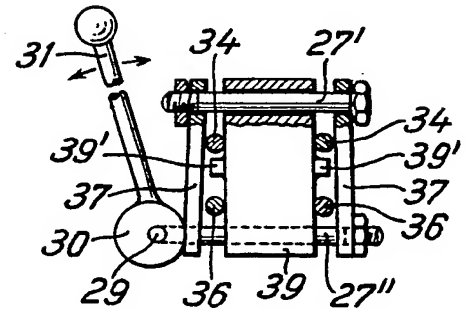


Fig. 1

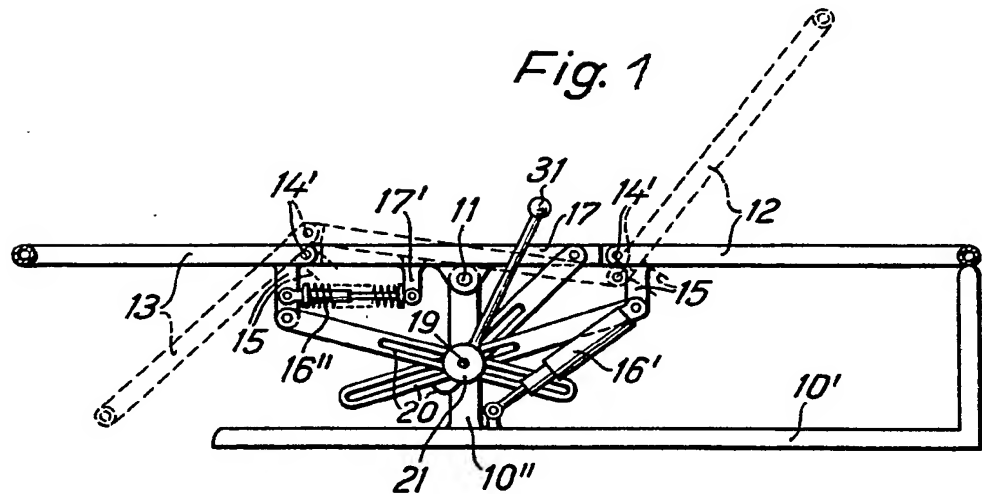


Fig. 1a

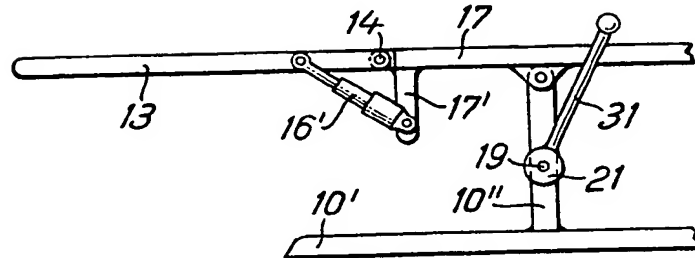


Fig. 5

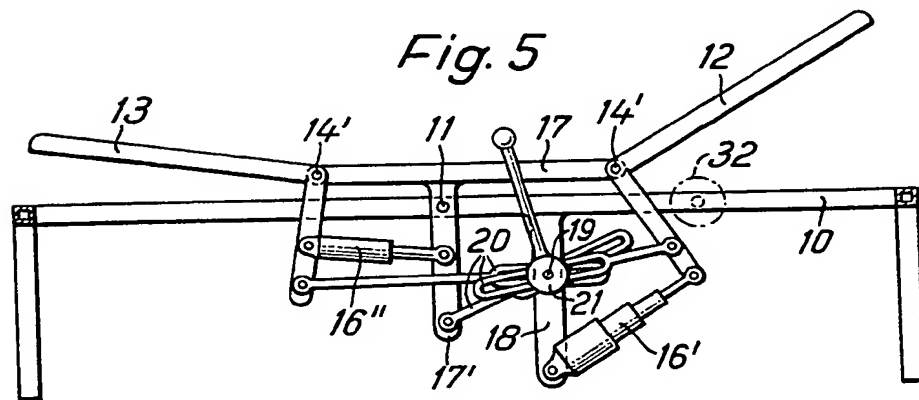


Fig. 5a

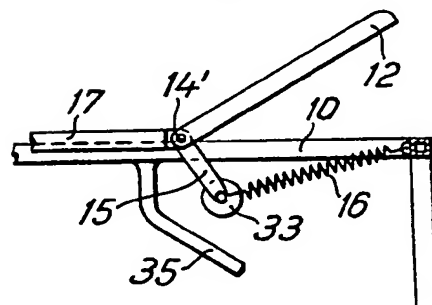
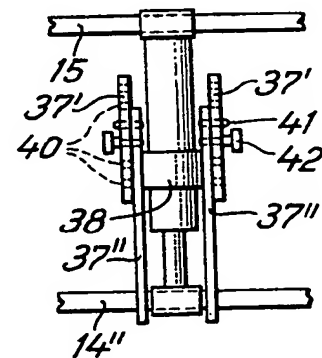


Fig. 5b



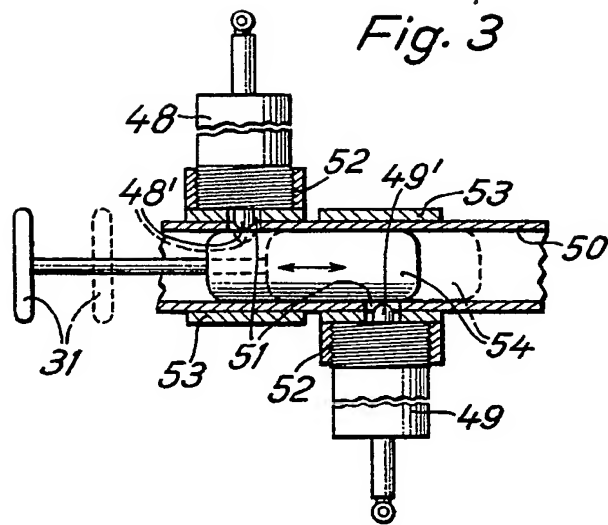


Fig. 6

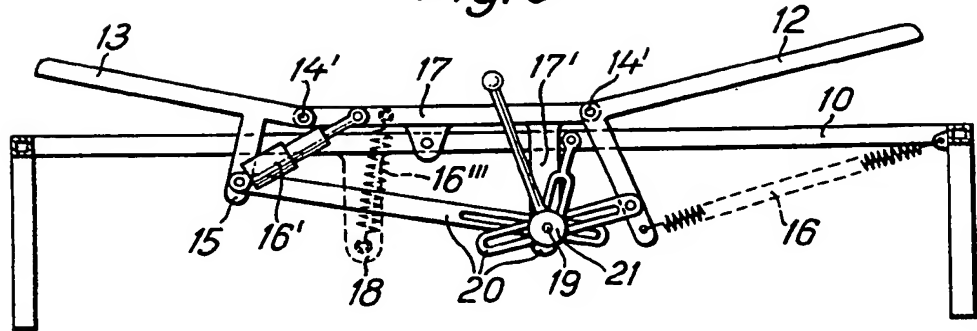
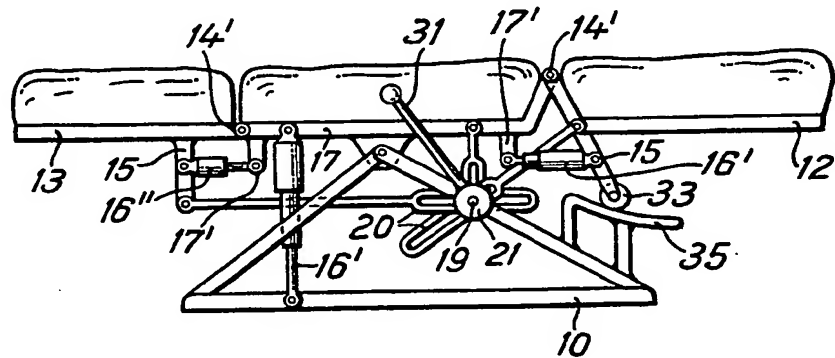


Fig. 7



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